ELEV-8

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TOOLS:

- Phillips screwdriver (1)
- Soldering iron solder (1)
- Wire stripper (1)
- wire snips (1)

PARTS:

- ELEV-8 Quadcopter Kit (1)
- Wireless Transmitter (1)
- RC Radio (1)
- LiPo Battery (1)

SUMMARY

Parallax's Quadcopter Kit, the ELEV-8, is a great way to get into flying RC. The build is fairly simple and you'll end up with an awesome quad that's stable, maneuverable, and quick. For now, you can purchase this kit directly from Parallax, but we'll have it in the Maker Shed soon!

Scroll down to the "Downloads and Resources" section on Parallax's product page for an awesome list of helpful resources, and watch videos of it in action here.

Throughout this build, please refer to Parallax's Assembly Diagrams (here). I'll be referring to each page in these instructions. If you've never built a quad (or done RC) before, definitely take a look at Hoverfly's awesome video tutorial series, found here.

At the end of Parallax's text Assembly Guide, in Figure 2, you can see the basic idea behind flying multirotors with an even number of motors: the direction of spin alternates to counteract the torque and automatic yaw of the copter (this is the function of the tail rotor on

normal helicopters). By varying the speed at which each motor spins, we can accurately control throttle (altitude), yaw, pitch, and roll, all while staying stable. We'll be building in the "X" configuration.

Step 1 — ELEV-8

- Turn to page 1 of Parallax's Assembly Diagrams document, and start assembling your motors! Our set screws were already Loctited in place, but check to make sure yours are as well with a small Allen key before proceeding.

- See those black spacers that came with the props? Punch the middle one out and press into the backside of each prop before installation. Remember, two rotate counterclockwise and two rotate clockwise. The tiny text should be facing up once they're mounted.

Step 2
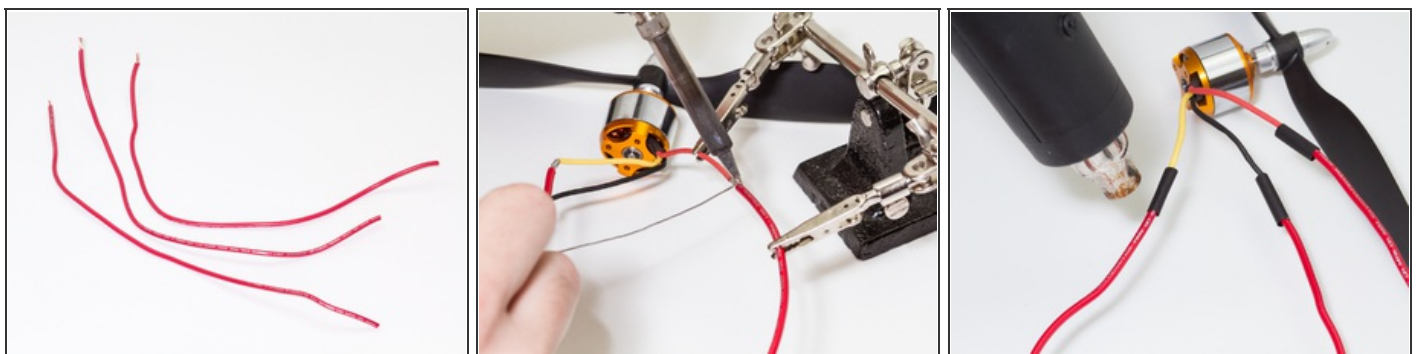
- Now we're going to wire up the motors. Cut three 1 foot lengths of the 16 AWG wire for each motor. Get some heat shrink ready, strip about a 1/4" off each end, and start soldering!

- If you don't have a heat gun, you can use a lighter or the thicker part of your soldering iron to "activate" the heatshrink.

Step 3
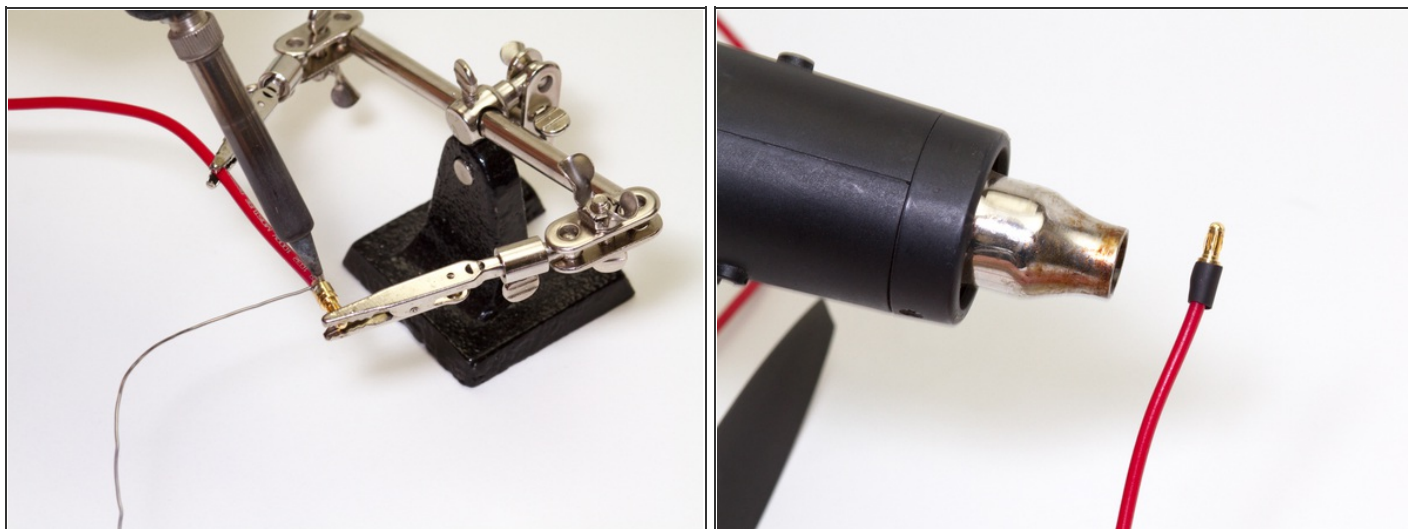
- Once you have all 12 wires heatshrinked, prepare to solder the male bullet connectors. Each of these has small hole in it, which you can use to direct solder right into the joint. (A pair of helping hands will come in handy here).

- Don't be afraid to really fill the connector with solder! After heatshrinking, these connectors should be very secure.

- If you've never soldered these before, now would be a great time to check out video number 5 in [Hoverfly's tutorial series](#).
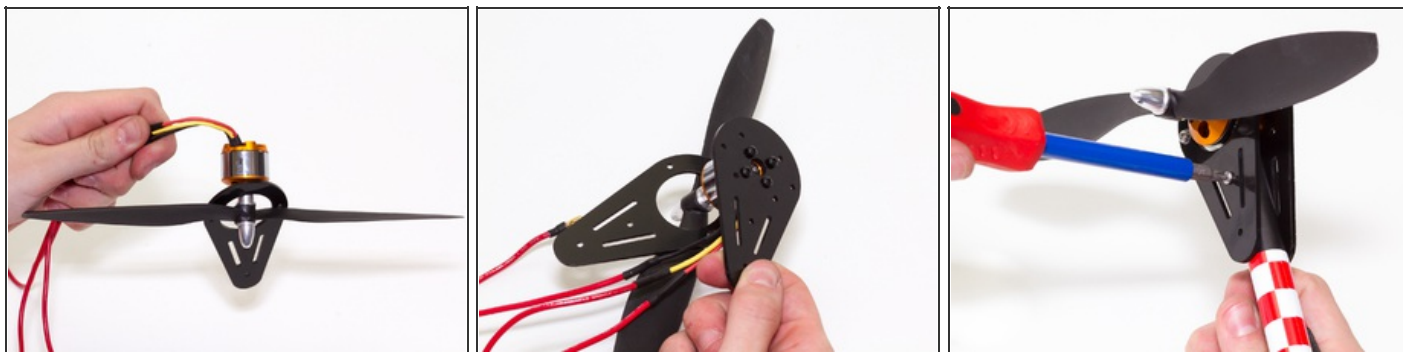
Step 4

- Carefully wrap each boom (the black circular tubes) with the included sticker wraps. Two red and two black!

- Once assembled, the 2 red booms should be adjacent to each other, not opposite. This will help keep you oriented during flight.

Step 5

- Next, we're going to fasten each motor to its mount. Put the top mount (the one with the larger hole) onto the motor first, then screw the bottom mount on (you should be referring to page 2 of the Assembly Diagrams now).

- Fasten the motor mounts to each other with plastic spacers, washers, and bolts. Don't forget to slide the 3 motor wires down the boom before tightening everything up.

Step 6
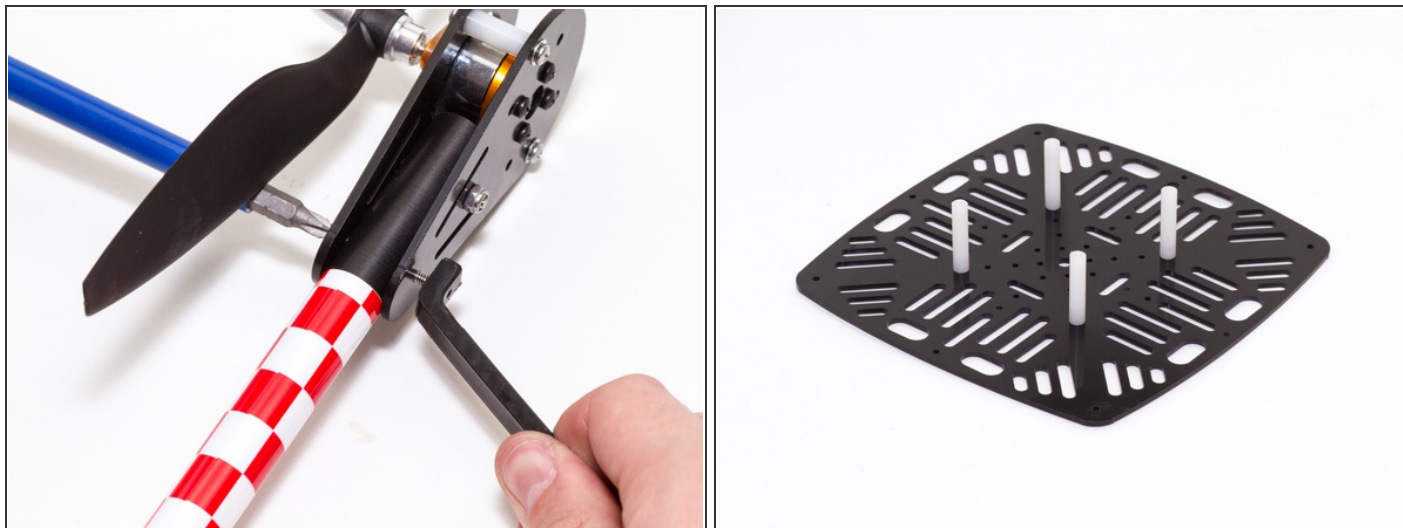
- After screwing on the black landing gear and each boom assembly is complete, move onto the main frame (Assembly Diagrams, page 3). This is a simple step—just a few spacers!

- After attaching the 4 spacers, set the top frame aside for later.

Step 7
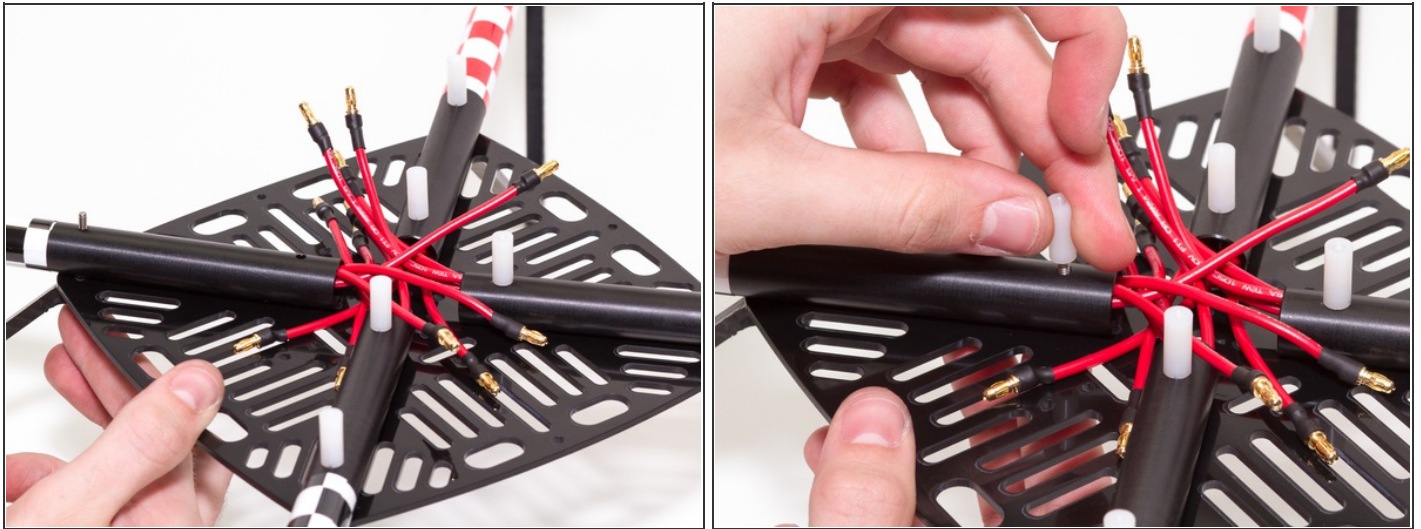
- Now refer to page 4 of the Assembly Diagrams, but don't install the top frame yet! Before that, attach each boom assembly to the bottom frame and start organizing your wires. I think you'll find that keeping the wiring neat is a real challenge on any multi-rotor build you do, so it's always a good idea to start organizing as soon as you can.

Step 8
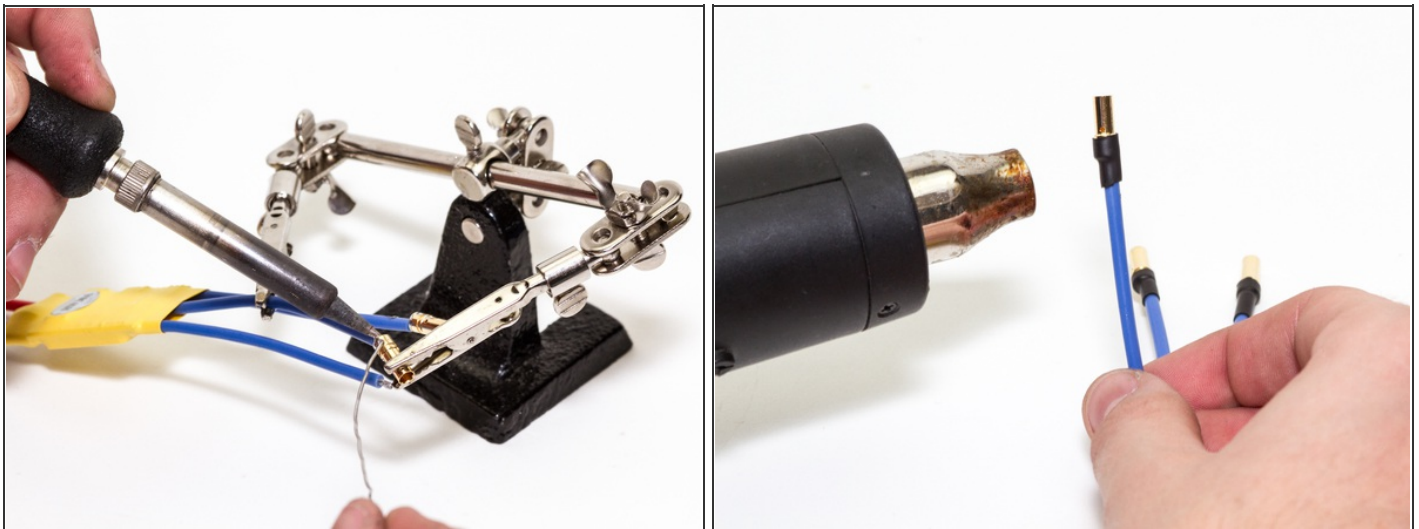
- Next, we're going to solder up our ESCs (Electronic Speed Controls). Each of the 3 blue wires gets a female bullet connector soldered onto the end. Use your helping hands to solder them just like the male connectors.

- Once again, please take a look at Hoverfly's video tutorial series (number 5 is on soldering) if you haven't soldered these before.

- One thing that you should do differently than I did is extend your heatshrink all the way to the end of the female connectors. This will insulate the connections from each other, preventing a short and possible crash.

Step 9
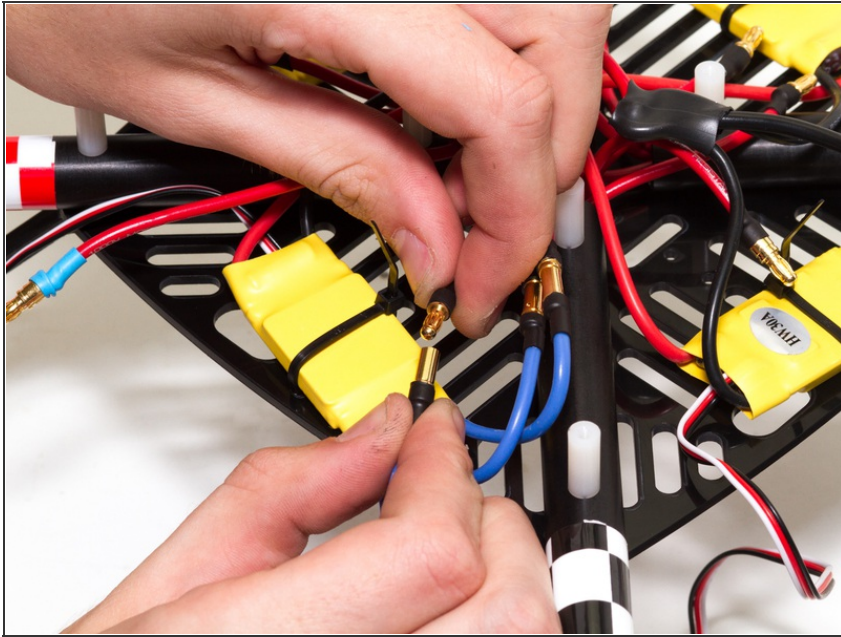
- Now you can attach the ESCs to the frame however you want to (I used a few of the included cable ties).

- Once they're in place, go ahead and hook up your motors! To change the direction that a motor spins, simply unplug any 2 of the 3 connectors and switch them.

- Now bind your RC transmitter to your receiver. I'm using a Spectrum Dx6i transmitter and an Orange receiver, and the binding process was a breeze. Refer to your transmitter manual for instructions.

- Now would be a good time to setup your ESCs. Turnigy's instructions are here. The proper settings can be found on page 34 of Hoverfly's User Guide.

Step 10
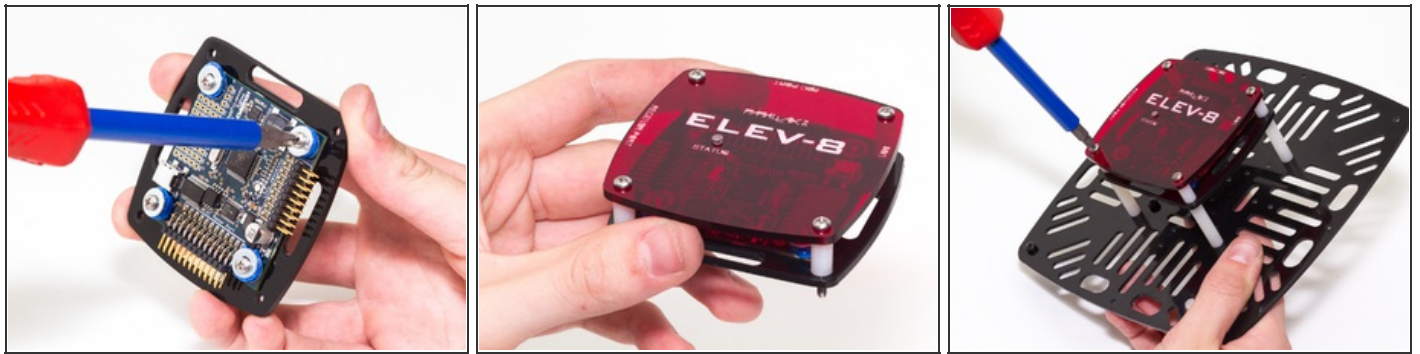
- Next, install the Hoverfly Open board onto the black plastic plate (Assembly Diagrams, page 6), but don't install the blue rubber grommets the same way I did…make sure you push them into the board so they're exposed on both sides.

- Don't over tighten these screws, since the grommets won't be able to absorb a lot of vibration if they're compressed too much.

- Now flip to Assembly Diagrams page 7 and install the acrylic top plate before mounting the whole board assembly to the top frame. Pay attention to the orientation of the Hoverfly board with respect to the red acrylic, and once that's all assembled, keep it off the bottom frame! We'll attach everything together once the wiring's done.

Step 11

- If you'd like to attach the included LEDs to your quad, now would be the time for that. One strip is red, and one is white (the ones with the yellow tinted LEDs are actually white). Use your soldering iron to heat up the joint in the middle of each strip, breaking it in two.

- Now solder and heat shrink an additional length of wire to the power and ground terminals on each of the four strips. Once everything's soldered up, peel the protective sheet off each strip, and stick them onto the underside of each boom!

- Don't worry about powering the LEDs just yet—we're going to wire them directly into the battery power so they're on whenever the quad's on.

- Make sure the power and ground wires for each LED strip are long enough. I used 6–8" on mine.

Step 12
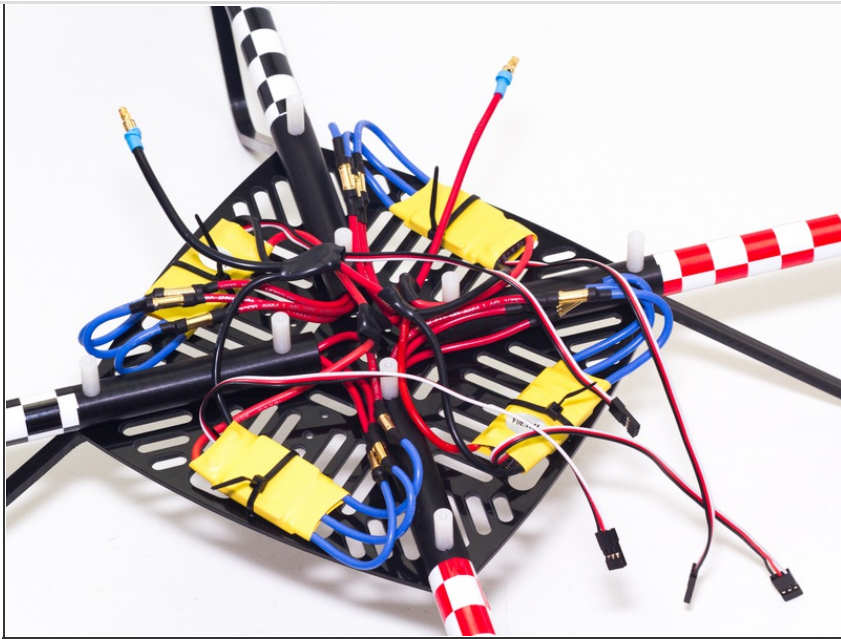
- Now it's time for the wiring harness. Here's what needs to happen: each of the four power and ground wires from the ESCs need to converge on a single, wider wire, which will be hooked up to the battery. We're also going to wire in each of the four LED strips, so that makes eight power and eight ground wires.

- Check out video number 5 of Hoverfly's tutorial video series for a great way to solder a wiring harness (skip to the 5:30 mark for wiring harness).

- Make sure you give yourself enough room to make all the necessary connections! Err on the side of too much wire to start with, and trim as needed.

- When it's all said and done, you should have just 2 wires with male bullet connectors on them, which will go to the battery. Everything else (other than the servo leads coming from the ESCs and your receiver) should be soldered/connected.

- My approach was to just jump right in and start soldering, but I would've done things differently if I'd seen Hoverfly's video…this step is largely up to you, but try to keep it neat, and use plenty of heatshrink.

Step 13
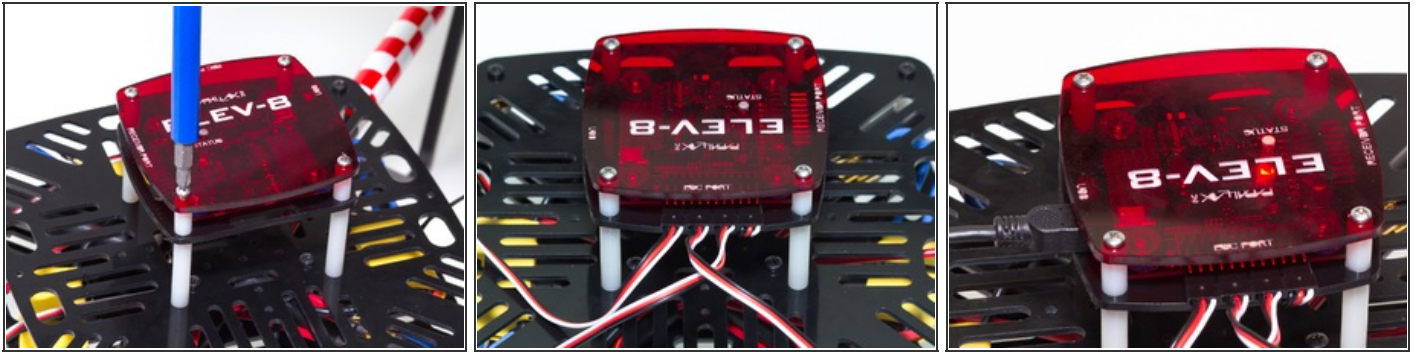
- Now it's finally time to install the top frame! Refer to Assembly Diagrams page 7 again, and screw everything into place.

- And now you can connect your ESC and Receiver wires to the board! Refer to Hoverfly's SPORT quick start guide (it's not the exact same board, but the installation is the same for both) to connect the ESCs and your Receiver.

- Plug your board into a PC, and download Hoverfly's Setup and Firmware Update Clients. Start reading at page 56 of the User Guide for instructions.

Step 14

- Now you should be ready to fly! Here are some tips:
  - Start nice and easy, but make sure you get the quad at least 3 or 4 feet off the ground.
  - To prevent your quad from accidently losing power in mid-air, secure your battery, and ensure that it won't come unplugged on its own.
  - You will crash, so buy a few extra props.
  - Keep the quad away from people while you're flying. Those motors spin very quickly, and getting struck by a spinning prop isn't very much fun.

Step 15

- Resource List:
  - [The official ELEV-8 build log on Parallax's forum](#)
  - [Hoverfly OPEN User Guide](#)
  - [Hoverfly Video Tutorial Series](#)
  - [Hoverfly Software Downloads](#)
  - [Hoverfly Board User Guides](#)
  - [Parallax Exploded Assembly Diagrams](#)
  - [Parallax Test Assembly Guide](#)

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